CLAIMS

What is claimed is:

1. A radio receiver comprising:

at least one amplifier to receive incoming radio signals; and

a control circuit coupled to the at least one amplifier, wherein the control circuit receives a quality indicator and adjusts the gain of the at least one amplifier based on the quality indicator.

2. The receiver of claim 1, wherein the at least one amplifier is an LNA having continuously variable gain that receives an input RF signal, and wherein the LNA includes a gain control input that is coupled to the control circuit to receive a gain control signal for adjusting the gain of the LNA.

3. The receiver of claim 2, further comprising a VGA coupled to receive an output of the LNA, and wherein the VGA includes a VGA control input that is used to adjust a gain factor of the VGA.

4. The receiver of claim 3, wherein the control circuit is further coupled to the VGA control input and the control circuit operates to control the gain factor of the VGA.

5. The receiver of claim 4, wherein the control circuit to control the gain of the LNA and the VGA in tandem and individually.

6. A receiver for receiving and demodulating an RF signal, the receiver comprising:

an LNA having continuously variable gain coupled to receive the RF signal and produce an amplified signal at an LNA output, the LNA including an LNA control input to receive an LNA control signal that adjusts a gain factor of the LNA;

a VGA coupled to the LNA output to receive the amplified signal, the VGA including a VGA output that outputs a VGA output signal to downstream components of the receiver, and wherein the VGA includes a VGA control input to receive a VGA

control signal that adjusts a gain factor of the VGA; and

a control network coupled to the LNA control input and the VGA control input, and wherein the control network operates to adjust the LNA and VGA gain factors based on a received power indicator of the RF signal.

7. The receiver of claim 6, wherein the control network operates to control the gain factors of the LNA and the VGA in tandem and individually.

8. The receiver of claim 7, wherein as the received power of the RF signal increases to a selected level, the control network operates to maintain the gain factor of the VGA and decrease the gain factor of the LNA.

9. The receiver of claim 8, wherein as the received power of the RF signal increases beyond the selected level, the control network operates to maintain the gain factor of the LNA and decrease the gain factor of the VGA.

10. The receiver of claim 6, wherein as the LNA comprises a shunt feedback circuit.

11. The receiver of claim 6, wherein as the LNA comprises a varactor used as a load of the LNA.

12. The receiver of claim 6, wherein as the LNA comprises a pin diode used as a load of the LNA.

13. The receiver of claim 6, wherein as the LNA includes a current-steering circuit.

14. The receiver of claim 6, wherein the receive power indicator is an estimate of the bit energy per spectral noise density (E_b/N_o).

15. The receiver of claim 6, wherein the receive power indicator is a received signal strength indicator (RSSI) signal.

16. A method of operating a receiver to receive an RF signal, the receiver

comprises an LNA with continuously variable gain that receives the RF signal and produces an LNA output signal coupled to a VGA, the LNA and VGA have control inputs to receive control signals that set gain factors of the LNA and VGA, respectively, the method comprising steps of:

determining that a received power level of the RF signal is varying within a first selected power range;

maintaining the gain factor of the VGA; and

adjusting the gain factor of the LNA so that a signal-to-noise ratio required for demodulation of the RF signal is met with a selected margin and the linearity requirements of the receiver are reduced.

17. The method of claim 16, further comprising steps of:

determining that the received power level of the RF signal is varying within a second selected power range;

maintaining the gain factor of the LNA; and

adjusting the gain factor of the VGA so that the signal-to-noise ratio required for demodulation of the RF signal is met.

18. A method of operating a receiver to receive an RF signal, the receiver comprises an LNA with continuously variable gain that receives the RF signal and produces an LNA output signal coupled to a VGA, the LNA and VGA have control inputs to receive control signals that set gain factors of the LNA and VGA, respectively, the method comprising steps of:

determining that a received power level of the RF signal is varying within a first selected power range;

adjusting the gain factor of the VGA; and

adjusting the gain factor of the LNA together with the gain factor of the VGA so that a signal-to-noise ratio required for demodulation of the RF signal is met with a selected margin and the linearity requirements of the receiver are reduced.

19. The method of claim 18, further comprising steps of:

determining that the received power level of the RF signal is varying within a

second selected power range;

maintaining the gain factor of the LNA; and

adjusting the gain factor of the VGA so that the signal-to-noise ratio required for demodulation of the RF signal is met.

20. A radio receiver comprising:

a continuously variable gain low noise amplifier (LNA) coupled to a subsequent variable gain amplifier (VGA);

a demodulator to generate an automatic gain control signal indicating a power of level of a desired received signal; and

a control network coupled to receive the gain control signal to optimally set the gain of the LNA and VGA.

21. The control network of claim 20, wherein the control network adjusts the gain of the continuously variable gain LNA and subsequent VGA in a way that minimizes LNA gain while maintaining the required signal quality for proper demodulation, the control network comprising:

an input for receiving a received signal strength indicator (RSSI);

an input for receiving a quality indicator of the demodulated signal; and

logic to perform a mapping function wherein the gain of the LNA and VGA are controlled optimally.

22. The control network of claim 21, wherein the logic to perform the mapping function operates to lower the gain of the LNA once the desired received signal power exceeds a level where interfering signals are possible until a gain range of the LNA is exhausted, at which point only the gain of the VGA is controlled.

23. The control network of claim 21, wherein the logic to perform the mapping function operates to lower the gain of the LNA and VGA together as the power of the received signal increases above a sensitivity threshold until the gain range of the LNA is exhausted, at which point only the gain of the VGA is controlled.

24. The control network of claim 21, wherein the quality indicator is one or

more of a bit energy per noise spectral density (E_b/N_o), a bit error rate (BER), and a frame erasure rate (FER).